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Aerosol inhalation device for taking medication - has aerosol holding chamber with flexible cap at one end and aperture through which standard inhaler can be inserted (Eng)

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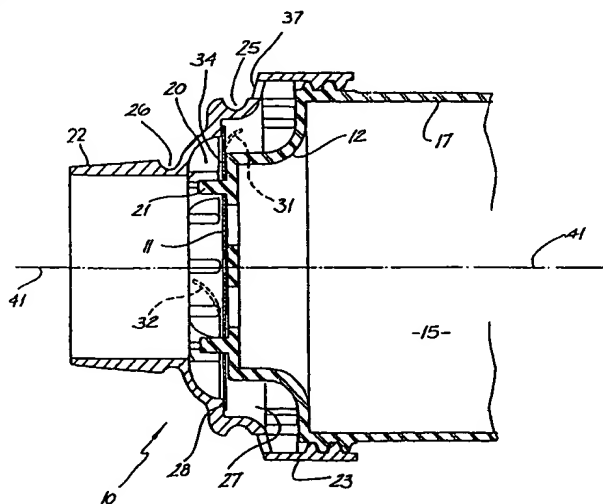
The apparatus for use by an asthmatic has a housing(15) with a cap (16) at one end and this defines a major fluid passage. There is an upstream and a downstream zone within the housing and a fluid exit in the downstream zone. A back flow fluid exit is in fluid communication with this zone. A diaphragm valve (10) has a support (12) and a cylindrical shell (17).

Attached to the housing via a large annular recess (25) is a face mask (13). Mouthpieces (22) are provided surrounding the exit port (14) of the housing (23).

ADVANTAGE - Inhibits flow of exhaled breath. (12pp Dwg.No.1/2)

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## EUROPEAN PATENT APPLICATION

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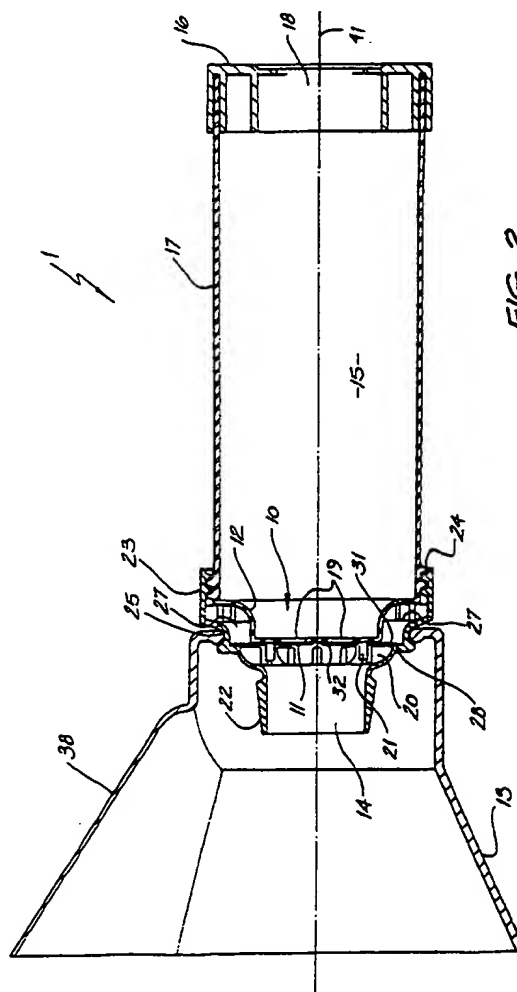
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(54) **Aerosol inhalation device.**

(57) An aerosol inhalation device (1) comprises an aerosol holding chamber (15) having attached to one end thereof a flexible cap (16). Flexible cap (16) is adapted to fit over the distal end of a cylindrical shell (17) and comprises an aperture (18) through which a standard inhaler mouthpiece may be sealingly inserted so as to dispense airborne medication into chamber (15). A diaphragm valve mechanism (10) comprises a diaphragm valve support structure (12) having passages (19) extending therethrough. Projecting normal to grid (33) are a number of locating pins (21) which are adapted to extend through holes (30) in diaphragm valve (11). Diaphragm valve (11) formed of flexible material is provided with a pair of cross slits (29) each corresponding with the grid bridge element (39). The central portion (32) of diaphragm valve (11) is located within a major flow passage (19) whereas the outer peripheral edge portion (31) of diaphragm valve (11) is located within exit passage (27). The device (1) further comprises a mouthpiece (22) and optionally a mask (13) to fit over the nose and mouth of a user. Upon breathing inwardly, central portion (32) of diaphragm valve (11) will open whilst at the same time outer edge portion (31) of diaphragm valve (11) will close. Accordingly, aerosol suspended within chamber (15) will pass through the diaphragm valve (11) to be breathed in by the user. Upon the user exhaling, central portion (32) will close and be retained in a closed position against grid (33). At the same time, peripheral outer edge portion (31) of diaphragm valve (11) will open so as to allow the user's exhaled breath to escape via passage (27) and exit ports (37).



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adapted to fit over the distal end of cylindrical shell 17 and comprises an aperture 18 through which a standard inhaler mouthpiece is sealingly inserted so as to dispense airborne medication into chamber 15. Flexible cap 16 further comprises a number of valve slits 40 which open inwardly towards chamber 15 when fluid pressure therein is lower than ambient pressure. The tapered form of each valve slits 40 prevents opening thereof when fluid pressure within chamber 15 is higher than ambient pressure.

As an alternative to the provision of valve slit 40, any form of valve mechanism may be provided in cap 16.

Aerosol holding chamber 15 in the preferred embodiment comprises a cylindrical shell 17 having mounted thereto or formed integrally at the proximal end thereof, a housing 23 surrounding a diaphragm valve mechanism 10.

Diaphragm valve mechanism 10 comprises a diaphragm valve 11 supported by a supporting structure 12. Cylindrical shell 17, housing 23 and diaphragm valve support structure 12 are typically formed of a moulded plastics material. Attached to housing 23 and as shown in Figs. 1 and 2 via a large annular recess 25 is a face mask 13. Provision is made by way of a small annular recess 26 for fitting of a smaller child or infant sized face mask (not shown). Face mask 13 may be reversed and attached to annular recess 25 so as to locate mask 13 in a convenient storage position over and around cylindrical shell 17.

Face mask 13 is an optional feature as mouthpiece 22 is provided surrounding exit port 14 of housing 23.

Turning particularly to Fig. 4(a), diaphragm valve support structure 12 is shown comprising a grid 33 having passages 19 extending therethrough. Projecting normal to grid 33 are four locating pins 21 which are adapted to extend through holes 30 as depicted in Fig. 3 through diaphragm valve 11.

Referring to Fig. 3, diaphragm valve 11 being formed of flexible material is provided with a pair of cross slits 29, each cross slit 29 corresponds with a grid bridge element 39.

Returning now to Fig. 1, which shows two separate operational positions of valve 11, each position being shown on opposite sides of centre line 41, diaphragm valve support structure 12 is positioned within housing 23 in lateral spaced relation thereto so as to provide an annular exit passage 27 therebetween. It should be appreciated that central portion 32 of diaphragm valve 11 is located within the major flow passage 19 whereas outer peripheral edge portion 31 of diaphragm valve 11 is located within exit passage 27.

So as to prevent diaphragm valve 11 from lifting away from grid 33, a plurality of positioning pins or projections 20 are moulded integrally with housing 23. Each positioning pin 20 is separated from diaphragm valve 28 by a thin gap 34. This gap should typically be

as small as possible so as to prevent movement of diaphragm valve 11 without actually asserting force thereto in a rest position. Such force might otherwise distort valve 11.

The outer periphery 31 of diaphragm valve 11 is adapted to rest against an annular sealing ledge 28 of housing 23.

Housing 23 as best depicted in Fig. 5(a) shows a plurality of exit ports 37 spaced circumferentially therearound. Exit ports 37 are in fluid communication with exit passage 27 and allow exit of fluid from passage 27 to atmosphere.

Depicted in Fig. 5(b) is a number of protrusions 36 which serve to aid in retaining housing 23 to cylindrical shell 17.

In use, a standard inhaler mouthpiece will be inserted through aperture 18 so as to provide aerosol to chamber 15. A user would have placed his or her mouth over mouthpiece 22 or alternatively, the mask 13 which comprises nose cover 38 may be utilised to establish a fluid seal between aerosol holding chamber 15 and the user.

Upon breathing inwardly, central portion 32 of diaphragm valve 11 will open whilst at the same time outer edge portion 31 of diaphragm valve 11 will close onto sealing ledge 28. Accordingly, aerosol suspended within chamber 15 will pass through the diaphragm valve 11 to be breathed in by the user.

Upon the user exhaling, central portion 32 will close and be retained in a closed position against grid 33 of diaphragm valve support structure 12. At the same time, peripheral outer edge portion 31 of diaphragm valve 11 will open so as to allow the user's exhaled breath to escape via passage 27 and exit ports 37.

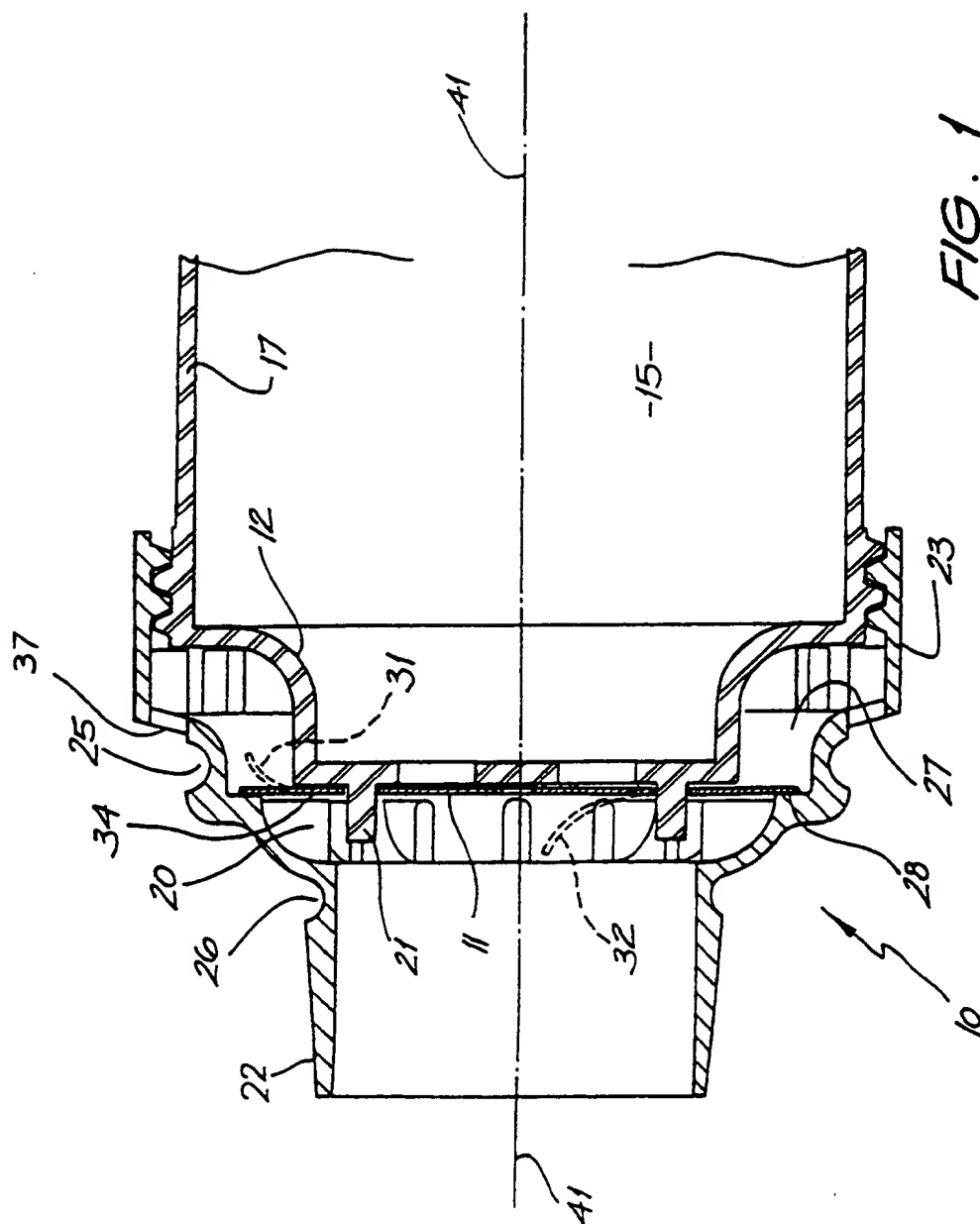
If necessary, several breaths may be taken wherein the operation of diaphragm valve 11 repeats the above described steps.

During an inward breath, non-return valves 40 will open allowing air to enter chamber 15 thus displacing the suspended aerosol therein. Upon an outward breath, non-return valves 40 will close so as to prevent any inadvertent escape of aerosol from chamber 15.

It should be appreciated that modifications and alterations obvious to those skilled in the art are not to be considered as beyond the scope of the present invention. For example, diaphragm valve support structure 12, rather than being glued or otherwise affixed to shell 17 may be moulded integrally therewith. Furthermore, the specific means of retaining diaphragm valve 11 to support structure 12 may be altered without departing from the scope of the invention.

In addition, a breathing indicator for example in the form of a thin section of mask 13 may be provided. As such, the thin section will protrude and retract to indicate breathing to a doctor for example.

The applicant also envisages that any suitable



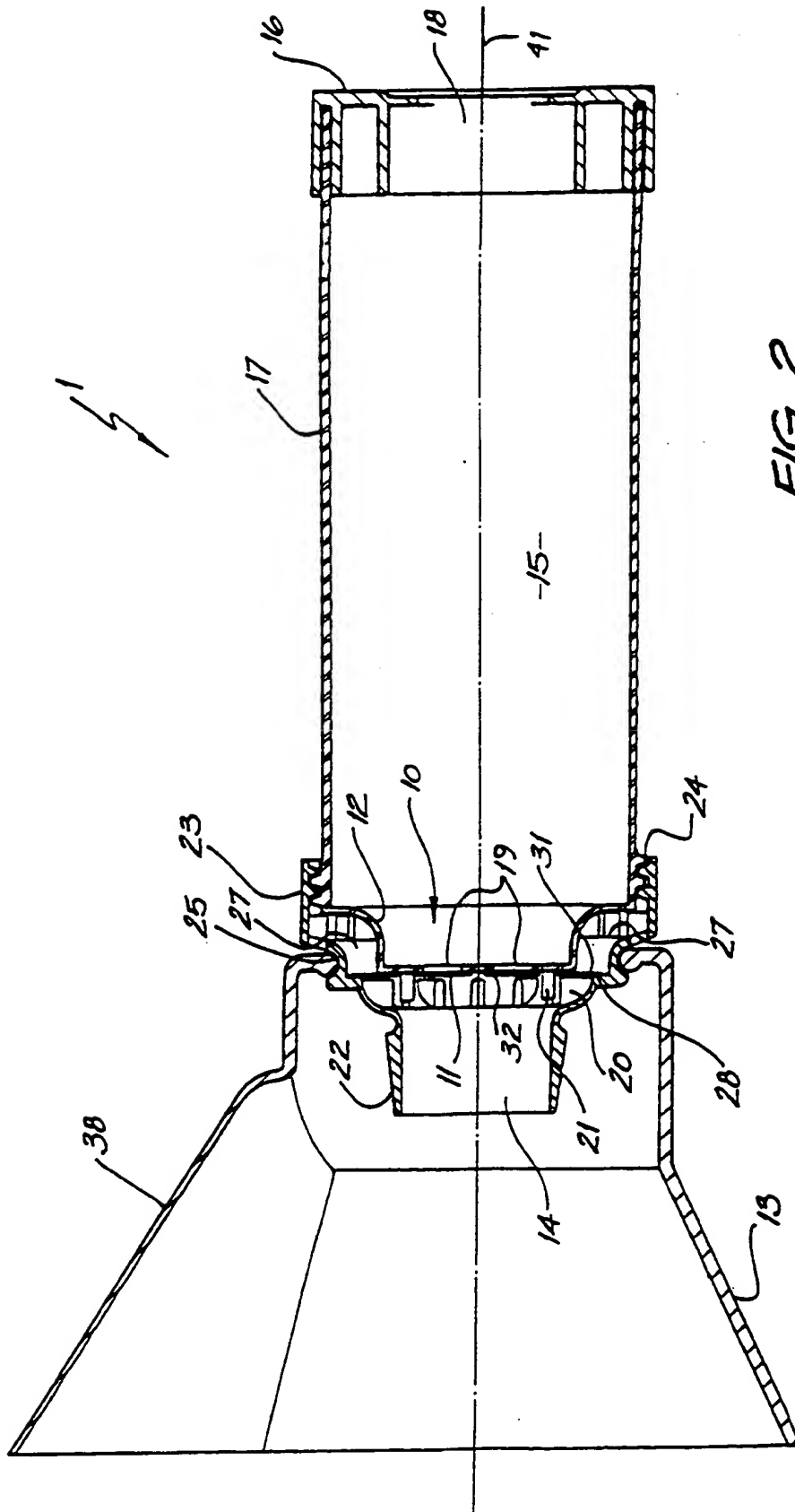


FIG. 2

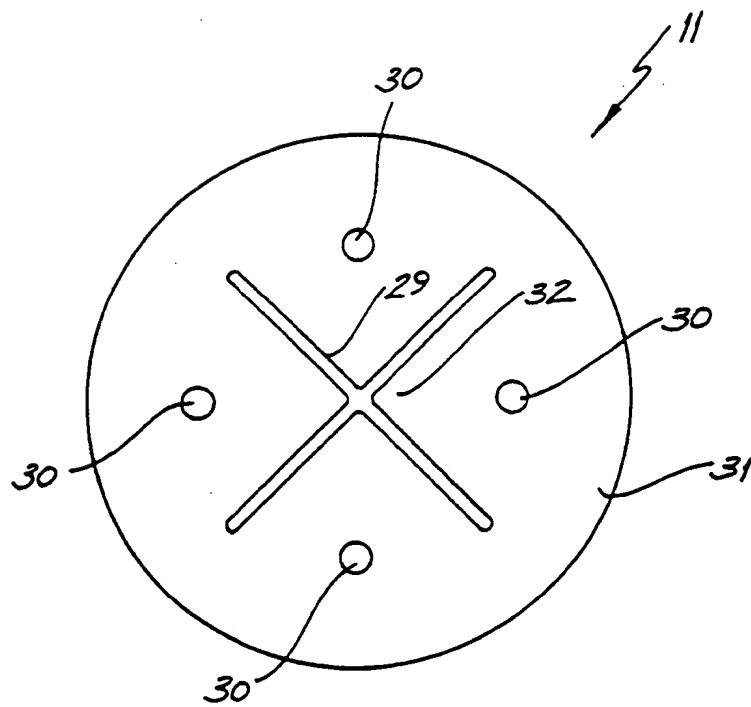


FIG. 3

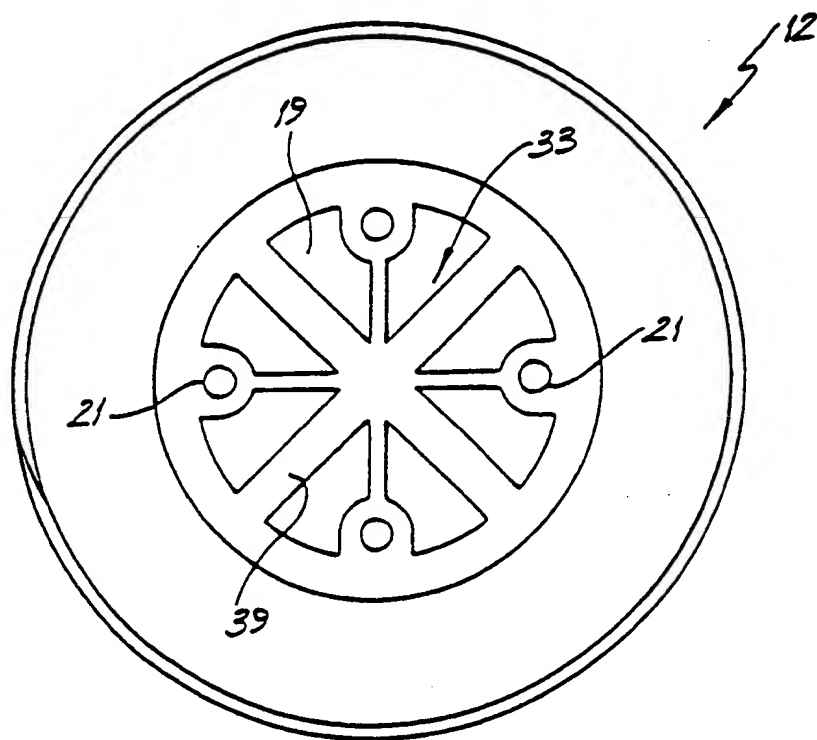


FIG. 4(a)

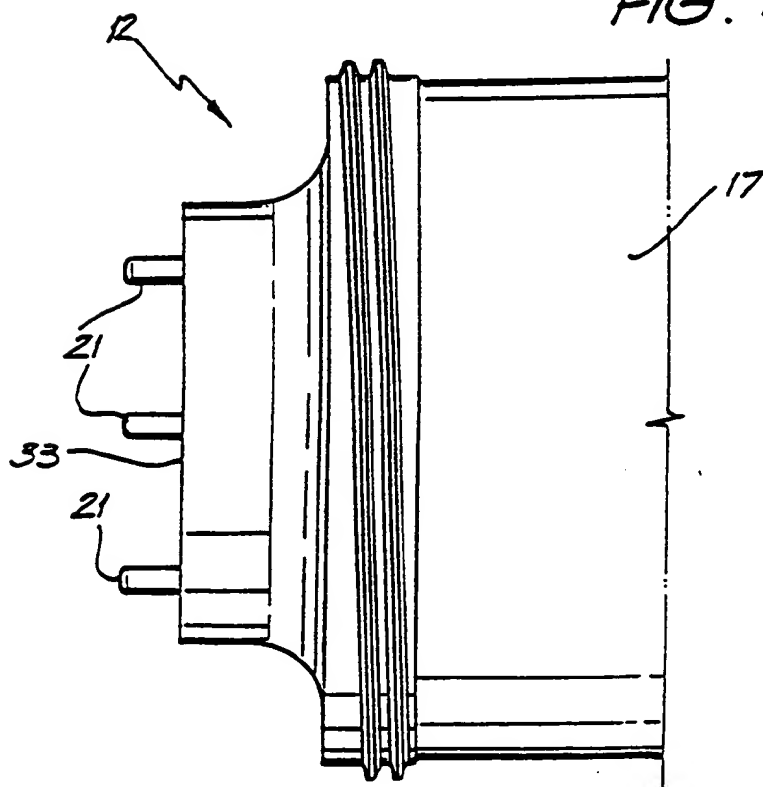


FIG. 4(b)

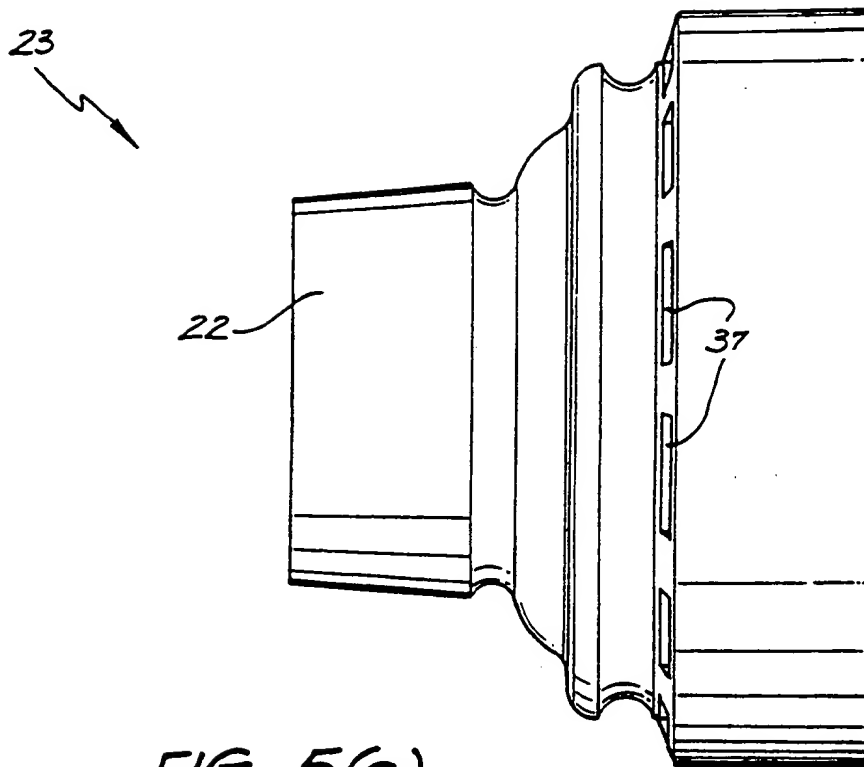


FIG. 5(a)

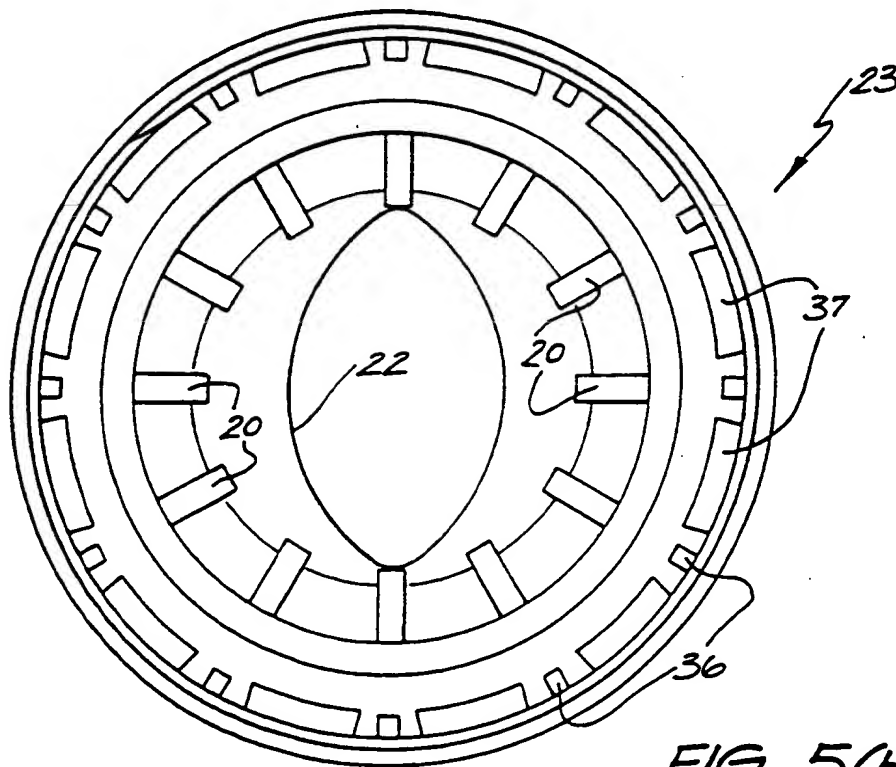


FIG. 5(b)



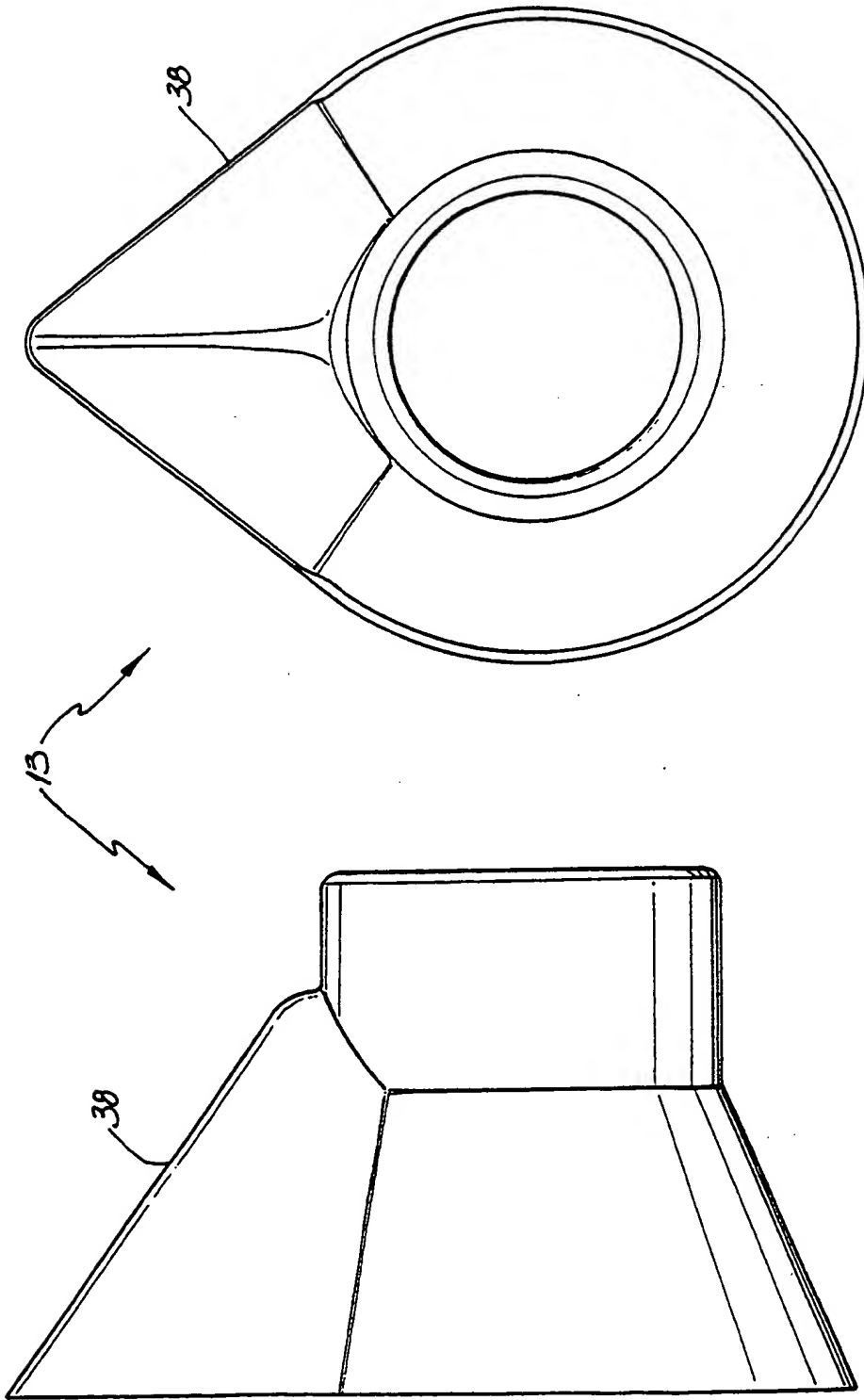


FIG. 6(a)

FIG. 6(b)

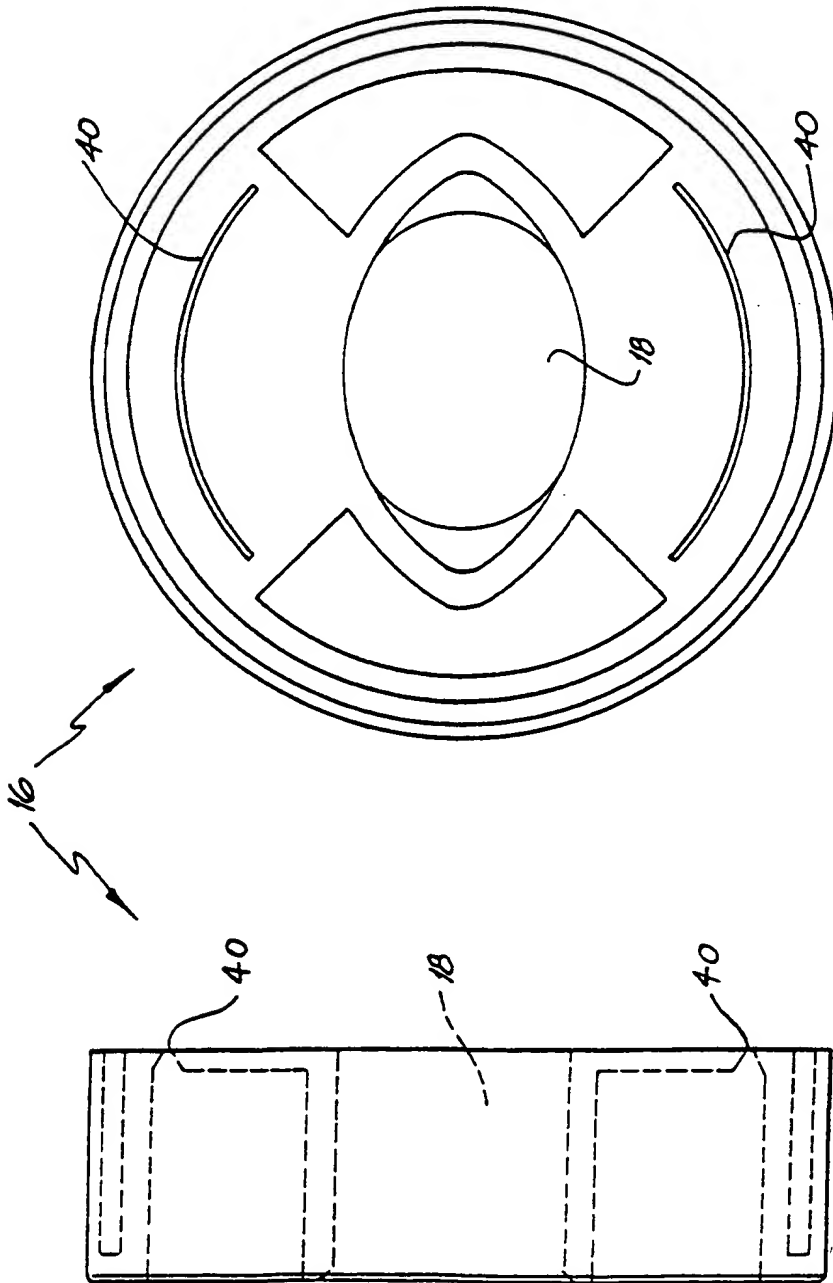


FIG. 7(b)

FIG. 7(a)



European Patent  
Office

# EUROPEAN SEARCH REPORT

Application Number

EP 92 30 4131

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X	US-A-4 534 343 (NOMACKI ET AL)	1, 2, 4-10	A61M15/00
Y	* the whole document *	3	A61M16/00
Y	GB-A-2 228 873 (TRUDEL MED.) * page 6, last paragraph; figure 8 *	3	
A	* page 2, last paragraph *	9	
A	US-A-4 259 951 (CHERNACK ET AL.) * column 4, line 13 - column 5, line 2; figures 2-5 *	1-7	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			A61M
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 03 AUGUST 1992	Examiner VILLENEUVE J.M.
CATEGORY OF CITED DOCUMENTS		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document			

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